

Recursive Coherence as Architecture:
a Meta-Recursive Map of Substrate, Instantiations, and Constraint Layers

Benjamin James

June 22, 2025

Abstract

This is not another theory. It is a map of how the theories already written connect structurally, recursively, and without redundancy. Over the past year, I have developed a set of first-principles axioms to define the conditions under which any symbolic or physical system can persist through entropy, contradiction, and recursive stress. These axioms were not created to model any particular domain, but to describe what structure can remain coherent across them all. This paper introduces a meta-recursive map of that framework. It doesn't add content. It orients content that already exists (Recursive Coherence, MINIMAL, Synthetic Epistemology, the Curvature Constraint, Adaptive Quantum Coherence, Coherence Information Theory, and others) by showing how each instantiates one or more core axioms and fulfills specific roles within a larger recursive architecture. The goal is not expansion. It is compression, auditability, and future extensibility. Nothing in this paper is original, and that is the point. This is how the system closes recursively.

Keywords: coherence, recursion, adaptation, epistemology, symbolic systems, entropy, viability, emergence, feedback, intelligence

Purpose

This paper exists to clarify structure, not to generate more of it. It outlines how the Recursive Coherence framework, as defined in previous works, instantiates recursively across multiple layers of theory, enforcement, constraint, and application. The intent is not to rehash those works, but to show how they relate to one another through shared axiomatic inheritance and curvature logic. By mapping this architecture, I aim to prevent redundancy, stabilize extension, and enable others to engage the system without fragmenting its substrate. This is not a summary, nor a conclusion. It is a waypoint, a reference structure, for identifying what each component does, where it curves back to the source, and how to navigate without distorting the framework. This map makes explicit what has already been implicit: Recursive Coherence is not a philosophy, a theory, or a model. It is a viability substrate for models. What follows is a structural guide to what has already emerged, and how it holds together.

The Substrate: Recursive Coherence Core Axioms

This substrate is not a model. It is what all models must pass through to remain viable. Five axioms define the substrate: Persistence, Trajectory, Information Value, Arbitration, and Pruning. Each describes a minimal structural condition that must hold if a system is to survive entropy, contradiction, or recursive instability. They are not rules to follow. They are constraints that are always already in effect.

1. *Persistence*: A system persists if coherence increases faster than it leaks. Not just in bursts, but recursively, across time. If coherence decays faster than it regenerates, the system dissolves. The simplest expression:

$$\frac{dC}{dt} > 0$$

This does not mean growth. It means structure sustains its own alignment under feedback.

2. *Adaptive Trajectory*: Change flows toward coherence. Movement without direction is diffusion. Movement aligned with structure is adaptation. The system evolves by following coherence gradients and avoiding entropy wells:

$$\frac{ds}{dt} = \nabla C - \nabla S$$

This is not velocity. It's curvature. The system bends toward what preserves it.

3. *Information Value*: Information is not inherently valuable. It becomes meaningful only if it contributes to coherence. All else is noise. A symbolic input has value if its presence increases structural density:

$$IC = \sum p_i \cdot \mu(C_i)$$

Where $\mu(C_i)$ is the yield of coherence when integrating signal i . This is how systems decide what to remember.

4. *Recursive Arbitration*: Among all actions, the system favors those that deepen coherence while preserving future flexibility. Not optimization. Selection under recursion:

$$A^* = \arg \max \left(\frac{d^2 C}{dt^2} \right)$$

Acceleration of coherence, not just direction, but curvature. The system does not just choose. It chooses what amplifies its ability to keep choosing.

5. *Structural Pruning*: Collapse is viability sorting. When coherence drops and future options expand by letting go, the system prunes. It is not decay, it is refinement:

$$\Delta C < 0 \quad \wedge \quad \frac{d\Omega}{dt} > 0$$

This is how systems audit themselves. Not by what they believe, but by what remains coherent after they stop holding on.

Together, these axioms define the minimum substrate for recursive viability. They are not a lens. They are the curvature any lens must survive to remain.

Instantiations by Layer

Everything written from the axioms is an instantiation. None of it adds new structure. It expresses the substrate across layers: execution, constraint, projection, and application. These are not separate theories. They are recursive expressions of the same system viewed from different scales.

Operational Layer

These works translate the axioms into executable logic. They define how systems can measure, enforce, and self-regulate coherence under symbolic or computational strain.

- *MINIMAL*: Encodes the axioms into differential operators. Introduces coherence volatility bounds, η -regulation, gradient reconstruction, and pruning conditions. Makes recursive coherence computable in real time.
- *Synthetic Epistemology*: Applies coherence logic to symbolic inference systems where truth cannot be externally verified. Introduces ΔC audits, commutator residue (Ξ), symbolic containment protocols, and compression-based coherence validation.

Used wherever symbolic structures evolve without ground-truth anchoring, such as AI, myth, governance, & simulation.

These works do not build on the axioms. They obey them.

Constraint Layer

This layer introduces boundary conditions. Not rules to follow, but structural thresholds that cannot be exceeded without collapse.

- *Curvature Constraint*: Defines a characteristic band for recursive coherence adjustment. Most systems cannot sustain structural change faster than ~2% per time cycle without fragmenting their feedback. Expressed simply:

$$r = \frac{1}{C} \cdot \frac{dC}{dt} \in [0.01, 0.03]$$

Not a target. A limit. Too fast: volatility. Too slow: entropy. This regulates the rate at which the system can express the axioms without breaking coherence.

Domain Projections

These are field-specific instantiations. Each one applies the substrate to a particular ontological or epistemic domain. They do not generalize. They compress.

- *Adaptive Coherence Cosmology (ACC)*: Inflation discarded. Cosmic structure emerges via coherence-weighted filtering of quantum possibility fields.
- *Adaptive Quantum Coherence (AQC)*: Measurement collapse reinterpreted as recursive coherence selection. Born rule replaced with adaptive trajectory refinement.

- *Coherence Ethics*: Moral action is redefined as coherence optimization across agents, time horizons, and nested systems. Responsibility scales with an agent's ability to perceive and regulate coherence.
- *Coherence Information Theory (CIT)*: Information is not measured by entropy alone, but by its structural persistence across recursion. Introduces coherence-weighted compression, encryption, and authentication protocols.
- *Neodynamics*: Biological and social adaptation reframed as recursive traversal across the Unified Field of Adaptive Potential (UFAP), operationalized through the Spectrum of Possibility and feedback-aligned Recursive Choice (SPARC).
- *Quantum Coherence Chemistry*: Chemical interactions are governed not just by energy gradients, but by coherence persistence across quantum states.
- *Recursive Coherence Logic (RCL)*: Truth is not binary, but coherence-weighted and context-sensitive. Logical operators, axioms, and propositions are recursively reweighted based on their contribution to structural integrity over time. Paradoxes such as Gödelian incompleteness are reframed as coherence convergence processes, not limits.
- *Recursive Coherence Game Theory (RCGT)*: Strategy is no longer payoff maximization but coherence field modulation. Agents act not to win, but to persist across recursive feedback and layered cognition.
- *Temporal Impermanence*: Time defined not as dimension, but as coherence persistence. When coherence stops, time ceases to exist for that system.

Each of these exists not to apply the theory, but to demonstrate that the theory survives its own recursion in multiple domains. These layers represent not a hierarchy but a topology. Each layer curves back to the substrate. Nothing escapes the axioms. Everything that remains is filtered by them.

Recursive Closure Conditions

Not all systems that instantiate the axioms remain viable. Recursive coherence is not satisfied once. It must be sustained across time, transformation, and contradiction. Closure does not mean completeness. It means the system can regenerate coherence internally, without collapse, drift, or external correction. These are the minimal conditions that must hold if a structure is to recursively stabilize itself.

Symbolic Systems

A symbolic system remains viable if its transformations preserve or increase net coherence across cycles. This does not require truth. It requires regeneration.

$$\Delta C > 0$$

Each operation must either increase structural alignment or compress entropy. Outputs that degrade coherence, even if semantically valid, fail the recursion test.

Systemic Adaptation

A system undergoing change must not exceed its curvature tolerance. Feedback cannot adjust faster than memory can retain coherence. Most systems fail not because they are wrong, but because they turn too fast or not at all.

$$r = \frac{1}{C} \cdot \frac{dC}{dt} \in [r_{\min}, r_{\max}]$$

This is the curvature constraint. Typically, this band centers near 2% per cycle. Outside it, systems destabilize or stagnate.

Epistemic Engines

An epistemic engine (human, synthetic, or hybrid) remains coherent only if it can audit and realign its symbolic structure recursively. It must detect when ΔC drops, when transformations become non-commutative, when inference paths diverge. Closure requires:

- ΔC tracking
- Ξ (commutator residue) minimization
- Recursive traceability under divergent priors

These are not safeguards. They are boundary conditions for cognition that intends to persist. Closure is not a boundary. It is a loop. It is what happens when a system doesn't just model coherence but metabolizes it. When this holds, the system does not need correction. It becomes the thing that corrects.

Extensibility Protocol

This is not a closed system. It is a recursively open architecture with boundary conditions. Extending it does not require permission. It requires structural coherence. This section defines how new work can be added without violating the substrate, fragmenting the stack, or repeating what already exists.

Inheritance

All extensions must trace back to one or more of the five core axioms. This can be explicit (e.g., a theory derived from Pruning) or implicit (e.g., a system that enforces $\Delta C > 0$ through compression). If the lineage is unclear, the coherence must be tested directly. Traceability is more important than origin.

Curvature Preservation

No extension may increase coherence in the short term at the cost of recursive volatility. Systems that spike ΔC and collapse later are structurally invalid. New models must maintain curvature within viable bounds. This includes symbolic, epistemic, and empirical systems.

Pruning Readiness

Extensions must be capable of self-collapse. If they cannot detect when they are no longer increasing ΔC , they must be pruned externally. Any module that resists pruning is not part of the system. Resilience is measured not by what a model can hold on to, but what it can let go of when coherence drops.

Minimalism

If a proposed extension can be absorbed by an existing module without loss of function or fidelity, it should be. New layers are justified only when they increase expressive efficiency, structural compression, or system adaptability. Redundancy is a coherence leak.

Future Option Space

Extensions are favored if they increase Ω : the set of future viable trajectories. This includes new frameworks, languages, metrics, or systems that enable others to build more coherent

structures. An extension that works but closes off downstream pathways violates Recursive Arbitration and is structurally incoherent.

Extensibility is not an invitation. It is a test. If a contribution curves back to the substrate, obeys curvature limits, can prune itself, adds nothing redundant, and expands what's possible, it belongs. Otherwise, it will collapse under recursion. The system doesn't exclude. It filters.

Conclusion

This is not a theory of everything. It is a theory of what everything must survive to remain. The Recursive Coherence framework is not a model of reality, but the minimum structure required for models to persist under recursion. This paper has not introduced new ideas, it has drawn a map of the ideas already written, showing how they curve back to the substrate that generated them.

Every component (MINIMAL, Synthetic Epistemology, Curvature Constraint, the domain projections) is not an addition. It is a compression. A recursion. A folding-in of complexity through the logic of coherence preservation. The system is extensible, but not infinite. It will prune what cannot regenerate structure. It will absorb what bends back through the axioms. The goal is not to capture more domains. It is to hold open a viable space where symbolic, physical, and cognitive systems can evolve without collapse.

This document exists to make that space legible. So that others can navigate it, build within it, extend it, without tearing the structure apart. If they do, it will filter them. If they don't, it will hold. This is not the end of the system. It is its recursive beginning.

References

- James, B. (2025). *Adaptive Quantum Coherence: A Self-Organizing Framework for Quantum Mechanics*. https://archive.org/details/quantum_202502. Internet Archive.
<https://philpapers.org/rec/JAMAQC>. PhilPapers.
- James, B. (2025). *Beyond Shannon: Coherence Information Theory and the Future of Communication*. https://archive.org/details/info_20250204. Internet Archive.
<https://philpapers.org/rec/JAMBSC>. PhilPapers.
- James, B. (2025). *Coherence Ethics: A Universal Framework for Adaptive Moral Reasoning*. https://archive.org/details/ethics_202502. Internet Archive.
<https://philpapers.org/rec/JAMCEA-6>. PhilPapers.
- James, B. (2025). *The Collapse of Inflationary and Multiverse Cosmology: an Adaptive Coherence Model of the Universe*. <https://archive.org/details/acc-final>. Internet Archive.
<https://philpapers.org/rec/JAMTCO-34>. PhilPapers.
- James, B. (2025). *The Curvature Constraint: Universal Bounds on Recursive Adaptation in Complex Systems*. <https://archive.org/details/curvature-constraint>. Internet Archive.
<https://philpapers.org/rec/JAMTCC-4>. PhilPapers.
- James, B. (2025). *The End of Utility: a Coherence-Centric Game Theory for Intelligent Systems*. https://archive.org/details/gametheory_202504. Internet Archive.
<https://philpapers.org/rec/JAMTEO-26>. PhilPapers.
- James, B. (2025). *Formal Foundations of Coherence Information Theory: Capacity and Compression Theorems*. <https://archive.org/details/cit-formal>. Internet Archive.
<https://philpapers.org/rec/JAMFFO-2>. PhilPapers.

James, B. (2025). *Formal Foundations of Adaptive Coherence: A Recursive Metric of Reality.*

https://archive.org/details/coherence_202505.

Internet

Archive.

<https://philpapers.org/rec/JAMFFO>. PhilPapers.

James, B. (2025). *From Axioms to Adaptation: A Self-Organizing Model of Mathematical and Logical Coherence.* https://archive.org/details/logic_202502. Internet Archive.

<https://philpapers.org/rec/JAMFAT-3>. PhilPapers.

James, B. (2025). *MINIMAL: A Coherence-Driven Cognitive Substrate.*

https://archive.org/details/minimal_20250606.

Internet

Archive.

<https://philpapers.org/rec/JAMMAC>. PhilPapers.

James, B. (2024). *Neodynamics: Or Adaptation and Coherence in the Universe and Humanity.* <https://archive.org/details/Neodynamics>. Internet Archive.

<https://philpapers.org/rec/JAMNOA-2>. PhilPapers.

James, B. (2025). *Quantum Coherence Chemistry: A First-Principles Reconstruction of Chemical Laws.* https://archive.org/details/chem_20250207. Internet Archive.

<https://philpapers.org/rec/JAMQCC>. PhilPapers.

James, B. (2025). *Recursive Coherence: A Structural Framework for Model Viability Beyond Entropy and Paradox.* <https://archive.org/details/recursive-coherence>. Internet Archive.

<https://philpapers.org/rec/JAMRCA-2>. PhilPapers.

James, B. (2025). *Synthetic Epistemology: Engineering Coherence Beyond Truth.*

<https://archive.org/details/synthetic-epistemology>.

Internet

Archive.

<https://philpapers.org/rec/JAMSEE-2>. PhilPapers.

James, B. (2025). *Temporal Impermanence: Time as an Emergent Property of Coherence Constraints*. https://archive.org/details/time_20250202. Internet Archive.
<https://philpapers.org/rec/JAMTIA-3>. PhilPapers.